UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

OCT 25 2002

Julie M. Spagnoli
Bayer Corporation
Regulatory Affair Manager
8400 Hawthorn Road
P.O. Box 4913
Kansas City, MO 64120

Subject: Propoxur Re-registration Eligibility Decision (RED)
Baygon 2% Bait; EPA Reg. N0. 3125-450
Baygon 70 WP; EPA Reg. N0. 3125-146
Baygon 1.5 EC; EPA Reg. N0. 3125-121
Efficacy Data Submitted February 25, 2002

Dear Ms. Spagnoli:

The Agency has completed its review of the efficacy protocol referred above. It has been determined that the protocol is acceptable for cockroach control. However, a more comprehensive literature search needs to be submitted in order to fulfill the efficacy data requirements for the claims for control of mosquitoes flies, fleas, and ticks. The detailed review is enclosed for your information.

If you have any questions or comments about this letter, please contact me at 703-605-0702.

Sincerely yours,

Stephanie Nguyen
Insecticide-Rodenticide Branch
Registration Division (7505C)

Enclosure

EFFICACY REVIEW

Baygon 2% Bait, Baygon 70 WP, and Baygon 1.5 EC

Date:	05/24/02
EPA Reg. No.	Baygon 2% Bait; EPA Reg. No. 3125-450 Baygon 70 WP; EPA Reg. No. 3125-146 Baygon 1.5 EC; EPA Reg. No. 3125-121
Case Number:	029589
DP Barcode:	D281487
Pest:	Cockroaches, flies, mosquitoes, fleas, hornets, wasps, brown dog ticks, scorpions, spiders, and other household pests
Formulation:	Propoxur [2-(1-Methylethoxy)phenol methylcarbamate] Baygon 2% Bait contains 2% propoxur Baygon 70 WP contains 70% propoxur Baygon 1.5 EC contains 19.6% propoxur
Purpose:	Provide efficacy data for reregistration of three propoxur products
MRID:	45614601. Performance Data: Efficacy of Baygon- Laboratory and field trials against cockroaches, mosquitoes, flies, ants, and wasps February 15, 2002. Bayer Corporation. Kansas City, Missouri. Bayer Brochure Number 2097.
Good Laboratory Practices:	No
Branch Supervisor:	Meredith Laws, Branch Chief
Team Reviewer:	S. Oonnithan Ph.D.
Efficacy Reviewer:	Joanne S. Edwards, Entomologist Joanne S Edwards 5/24/02

DISCUSSION:

Efficacy data in this report are intended to support the continued use of pest control products containing the active ingredient propoxur. A total of eleven laboratory trials were submitted. Of these, Report Numbers 4 through 8 (pages 32 through 88) and Report 10 (pages 90- 97) deal with efficacy information on a combination product, Baygon CIK AE, containing the active ingredients propoxur and cyfluthrin. Since these studies are not applicable to this action, they were not examined. A total of six field trials were submitted. Of the six field trials, Report Number 4 (page 109) does not appear to deal with any propoxur formulation; Report Number 5 (page 110) deals with various encapsulated formulations, and Report Number 6 (page 111) deals with a combination product (DEF and piperonyl butoxide). Since these studies are not applicable to this action, they were not examined.

Report 1. S.F. Abd-Elghafar *et.al.* 1990. Toxicity of several insecticide formulations against adult German cockroaches (Dictyoptera: Blattelidae) J. Econ. Entomol. Vol. 83, (6) pg 2290- 2294.

This laboratory study examined the toxicity of five classes of insecticides to the adult German cockroach. Propoxur (Baygon, 1.5% emulsifiable concentrate) was one of the carbamates tested. Toxicity was determined by topical application to anesthetized cockroaches. There were 5-8 doses for each insecticide tested; and four replicates each (10 cockroaches per replicate). A control (treated with 1 *ul* of acetone) was also employed. The LD50's were estimated using probit analysis. Propoxur's LD50 to the adult male German cockroaches was 9 *ug*/g. The LD50 to the adult nongravid female German cockroach was 18.25 *ug*/g and the LD50 to the gravid female German cockroach was 13.72 *ug*/g. In general, for all insecticides tested, males and gravid females were more sensitive than nongravid females. Findings for all adult cockroaches were: pyrethroids > pyrethrins = organophosphates (except malathion)> carbamates = amidinohydrazon. This research demonstrates insecticidal activity of propoxur to cockroaches.

Report 2. Kaakeh, W. and G.W. Bennett 1994. Contact activity and residual persistence of cyfluthrin and propoxur formulations against German Cockroach, *Blatella germanica* (L.). Center for Urban and Industrial Pest Management. No. 074-94-00034.

These panel tests examined the contact toxicity and residual persistence of two formulations of propoxur (Baygon 20 EC and 1.5 EC) and two formulations of cyfluthrin (FCR 4545 WP and Tempo WP) against adult male German cockroaches. The propoxur formulations were tested at 8 fl. oz per gallon of water (cyfluthrin at 19 g per gallon of water). Tempered masonite panels were treated with a sprayer at rate of 1 gal/1000 ft^2. After treatment panels were stored under greenhouse conditions for various periods of time, *i.e.*, 1, 7, 14, 21 and 28 days. After each aging period, groups of 10 cockroaches each were confined to the treated panel for 1 hour, then transferred to glass jars for observation. Mortality readings were taken at 0.5, 3, 24 and 48 hours after exposure. There were 4 replicates per treatment. Results showed:

% Mortality at selected time after exposure

Aging period	Formulation	30 min	24 hr	48 hr
1 day	20 EC	0	50	92.5
	1.5 EC	0	25	72.5
	Tempo 20 WP	100	100	100
	FCR 4545 10 WP	**27.5**	**97.5**	**100**
7 day	20 EC	0	5	85
	1.5 EC	0	0	80
	Tempo 20 WP	95	100	100
	FCR 4545 10 WP	62.5	90	100
14 day	20 EC	0	0	0
	1.5 EC	0	0	0
	Tempo 20 WP	5	45	57.5
	FCR 4545 10 WP	32	70	100
21 day	20 EC/1.5 EC	0	0	0
	Tempo 20 WP	10	12.5	25.0
	FCR 4545 10 WP	0	0	22.5
28 day	Tempo 20 WP	0	0	5
	FCR 4545 10 WP	0	0	2.5

Results showed the cyfluthrin formulations had greater knockdown and residual activity than the propoxur formulations. Propoxur demonstrated 80-85% residual mortality at 48-hour exposure on panels aged up to 7 days.

Report 3. Kaakeh, W. and G.W. Bennett 1994. Laboratory evaluations of the flushing activity and knockdown effect of cyfluthrin and propoxur formulations against German cockroach, *Blatella germanica* (L.). Center for Urban and Industrial Pest Management. No. 074-94-0001.

These laboratory tests examined the comparative flushing activity and knockdown efficacy of two formulations of cyfluthrin (FCR 4545 WP and Tempo WP) and two formulations of propoxur (Baygon 20 and Baygon 1.5 EC). The propoxur formulations were tested at 8 fl. oz per gallon of water, and the cyfluthrin formulations were tested at 19 g per gallon of water. Flushing activity (FT50 = time to flush 50% of the test cockroaches from the harborage site) and knockdown effect (KT50 = time to knockdown 50% of the test cockroaches) were determined for the four formulations. The harborages were constructed with masonite panels and pine strips measuring 4" by 2.5 " by 0.5" high. These structures were placed in plastic boxes. Sprayers

delivered at 1 gal finished spray/1000 ft^2 to test insects within the harborage. There were 10 cockroaches/harborage, and a total of twelve replicates per treatment. Observations of knockdown (defined as incapable of movement upon prodding) were made up to 60 minutes after treatment. Results showed that for flushing activity, there was no statistical difference among the Baygon 1.5 EC, and two cyfluthrin formulations. At 60 minutes, percentages of flushed cockroaches were 66.7 %, 80.8 %, 91.7 %, and 88.3 % for Baygon 20 EC, Baygon 1.5 EC, FCR 4545 WP and Tempo WP, respectively. Probit analysis of flushing time showed Baygon gave the fastest 50% flushing time (3.1 minutes), followed by FCR 4545 WP (3.2 minutes), Tempo 20 WP (5.2 minutes), and Baygon 20 EC (7.4 minutes). The knockdown time (KT50), inside and outside of harborage, was fastest for Baygon 1.5 EC (5.7 minutes), followed by Baygon 20 EC (7.1 minutes), FCR 4545 WP (18.2 minutes) and Tempo WP (25 minutes). The study authors suggested the reason the knockdown response was greater for the Baygon formulations could be attributed to the solvents present in the Baygon formulations which may have facilitated a more rapid insecticide penetration of the cockroach cuticle.

This laboratory research on the German cockroach demonstrates both flushing and knockdown ability of the two propoxur formulations tested, with propoxur 1.5 EC demonstrating greater efficacy than the 20 EC formulation.

Report 9. Reid, B.L. and G.W. Bennett 1992. Speed of action in cockroach baits. Insectic. And Acar. Tests 17:381.

This lab test evaluated the knockdown speed of action of various insecticides. Groups of 10 German cockroaches were placed in petri dishes supplied with water and cardboard harborage. One gram portions of each test bait were placed in petri dishes and morality was recorded periodically up to 48 hrs. There were six replicates per treatment and a control was employed. Propoxur and chlorpyrifos demonstrated the greatest speed of action (both had LT50's less than 2 minutes). LT50's (time to mortality for 50% of the roach nymphs) was: 15-36 minutes for Abamectin, 24 minutes for chlordecone/Kepone, 1.6 minutes for chlorpyrifos, 37 minutes for hydramethylnon/Combat, 0.25 minutes for propoxur 2%; and 15-17 minutes for sulfluramid/RAID Max and PCO paste.

This laboratory research demonstrates quick knockdown of German cockroaches by the propoxur 2% bait.

Report 11. Yonker, J.W. and GW Bennett 1986. Evaluation of baythroid against the German cockroach. Insectic. and Acar. Tests. 11:450.

In this laboratory test, residual toxicity of various formulations of a synthetic pyrethroid, Baythroid, were examined.. A 1.1% concentration of Baygon 1.5 EC was included in the test for comparison. Particle and plywood surfaces were sprayed at a rate of 1 gal/1000 ft2. German cockroaches were then confined to the treated surfaces. There were four replicates of 10 males each for each treatment. Dead/morbidity observations were made at intervals up to 48 hours post-

exposure. Results for Baygon were:

Particle Board								
	% Dead/Morbid at:							
Aging	10 min	15 min	30 min	1 hr	2 hr	4 hr	24 hr	48 hr
1 day		3	45	100				
1 wk			5	80	100			
2 wks			25	90	100			
4 wks					100			
8 wks				13	28	38	48	48
Plywood								
1 day			3	40	95	100		
1 wk					30	68	75	85
2 wks								?
4 wks						7	13	41
8 wks					13	13	13	13

This laboratory research demonstrates residual activity of the propoxur 1.1% solution. The data show that Baygon 1.5 EC gives 100% control of cockroaches up to four weeks on particle board, and 68% control up to one week on plywood surfaces.

FIELD TRIALS:

Report 1. Bohnert, T.J. *et.al.* 1992. Field trials of insecticidal sprays. Insectic. And Acar. Tests; 17:373, 374.

Efficacy and residual activity of six different spray treatments were examined in field trials conducted in Gary, Indiana. The treatments consisted of 1% Baygon; 0.1% and 0.2% formulations of 0.2% permethrin; 0.2% pyrethrins and 0.5% piperonyl butoxide (PPPB); 0.1% cyfluthrin, 0.05% pyrethrins, 1% Baygon and 1% piperonyl butoxide (CPBPB); and 0.1% pyrethrins, 0.4% tetramethrin and 0.15% cypermethrin. (PTC). Initial applications were made, followed by a second application after four weeks. Pretreatment counts of cockroaches were made by visual observation in kitchen and bathroom areas. Only those apartments with 20 or more observed cockroaches were used in the study. Results were based on % reduction in visual counts from pretreatment counts. For Baygon results were: 33% reduction at 2 weeks, 46% at 4 weeks, 45% at 8 weeks and 37% at 10 weeks. Among all the treatments at the two week observation period, there were no statistically significant differences among them.

This data demonstrates adequate residual control of cockroaches using Baygon 1% solution under field conditions for four weeks and for another four weeks with a second application.

Report 2. Braness, G.A. and C.W. Bennett 1990. Residual effectiveness of insecticides for control of German cockroaches (Dictyoptera:Blattellidae) in food-handling establishments. J. Econ. Entomol. 83(5):1907-1911.

This study was designed to determine the longevity of residual insecticides aged at various sites in food-handling establishments. Treatments of exposed surfaces were compared to treatments of cracks and crevices to determine if insecticide placement affected the amount of insecticide remaining on treated surface. Treatments tested were 0.5% chlorpyrifos; 1.1% propoxur (Baygon 1.5 E) and a combination 1.1% propoxur and 0.5% chlorpyrifos. Three sites (kitchens/Purdue University, Indiana) within each kitchen were treated. The sites consisted of a dishwashing site, food preparation site and food storeroom site. The control was a site in an entomology laboratory where constant environmental conditions were maintained (*e.g.*, 12:12 (L:D) photo period, constant 25°C and 50% RH)efficacy and residual activity of six different spray treatments were applied,.

Dilute aqueous sprays of the ECs were applied to stainless steel panels. Separate panels were also sprayed to determine the amount of insecticide residue at 0 day. After 24 hours of aging the panels were randomly placed on 0.6 cm plywood sheets vertically positioned against walls or behind equipment at the test sites. There were three replicates per site. For crack and crevice treatment simulation, the treated surface faced the plywood (0.48 cm spacing), and for exposed surface simulation the treated panels faced away from the plywood panels. The treated panels were removed from the test sites for bioassay and chemical sampling at 1, 14, 21 and 28 days after treatment.

For the bioassays, 10 adult German cockroaches each were confined using a plexiglass apparatus placed on the treated panels. Exposure times were 15 minutes for the combination formulation, 20 minutes for propoxur and 1 hour for chlorpyrifos (exposure times selected based on preliminary studies showing time required to kill all cockroaches on 1 day old treated panels). After the exposure period, cockroaches were returned to untreated jars and supplied food; mortality was recorded at 1, 24 and 48 hours after exposure. Residues were analyzed using gas-liquid chromatography. % mortality and amount of residue recovered for the treatments were compared using analysis of variance. Correlation between mortality and amount of insecticide residue was determined with Pearson's correlation coefficient.

Results showed that mortality was the greatest for treatments of cracks and crevices than for treatments on exposed surfaces. The mortality at the dishwasher site was lower than the other sites and was attributed to vapor pressure deficit. There was a close cooperation between amount of residue recovered on treated surfaces and cockroach mortality.

This data demonstrates efficacy and residual activity of propoxur 1.1% solution under simulated field conditions.

Report 3. Mampe, C.D. 1994. Field trials for Baygon 20 EC and FCR4545 (10 WP and 1 SC). No. 075-94-001.

These field trials were conducted in garden apartments in central New Jersey in 1994. Thirty-two identical apartments with heavy infestations of German cockroaches were treated. Counts were made before application and at 30 and 60 days after treatment. Counts were based on visual observation after directing air into cracks and crevices using a compressed air sprayer. Results for Baygon treatments were:

		Percentage Control at:		
Chemical	Concentration	0 Day Count	30 Day Count	60 Day Count
Baygon 1.5 EC	1.1%	72	96	87
Baygon 20EC	1.1%	97	94	93
Baygon 20EC	0.55	61	98	70
Dursban	0.5	57	84	65

Results show acceptable control of German cockroaches up to sixty days after treatment for both concentrations of Baygon (0.55% and 1.1%). According to the study author, the Baygon 20EC was more acceptable than the Baygon 1.5EC, although flushing was reduced.

RECOMMENDATIONS

The submitted information is sufficient to support the efficacy claims for the Baygon 1.5 EC and Baygon 70 WP formulations (0.5%-1.1% solutions) and 2% bait for cockroach control.

No data or literature citations were submitted to support claims for control of mosquitoes, flies, fleas or ticks on treated exterior surfaces. It is generally acknowledged that propoxur exhibits residual activity and has both "knockdown" and "flushing" activity against a range of insect pests. However, in order to fulfill the efficacy data requirements, the registrant should be asked to provide a more comprehensive literature search. A listing of each data citation and abstract will probably be sufficient.